

Listing of the Claims

1. **(currently amended)** A method of manufacturing an optical waveguide preform, said method comprising:
exposing a soot preform to an atmosphere including a chlorine-containing ~~compound~~ gas and thereby doping the soot preform with chlorine, wherein the absolute pressure of the atmosphere is substantially greater than ~~about~~ 1.013×10^2 kPa.
2. **(original)** The method of Claim 1 including, prior to said step of exposing the soot preform, inserting the soot preform into a consolidation furnace.
3. **(original)** The method of Claim 1 including:
drying the soot preform prior to said step of exposing the soot preform; and
sintering the soot preform following said step of exposing the soot preform.
4. **(original)** The method of Claim 1 wherein the mole percentage of chlorine present in the atmosphere is greater than about 20%.
5. **(original)** The method of Claim 1 wherein the mole percentage of chlorine present in the atmosphere is between about 20% and 40%.
6. **(original)** The method of Claim 1 wherein the weight percentage of chlorine present in the soot preform is greater than about 1%.
7. **(original)** The method of Claim 1 wherein the weight percentage of chlorine present in the soot preform is between about 1.0% and 1.5 %.
8. **(currently amended)** The method of Claim 1 wherein the chlorine-containing ~~compound~~ gas is selected from the group consisting of GeCl_4 , SiCl_4 , Cl_2 , CCl_4 , SOCl_2 , POCl_3 and combinations thereof.
9. **(original)** The method of Claim 1 wherein the atmosphere is at a temperature of at least about 1000 °C.

10. **(original)** The method of Claim 1 wherein the atmosphere is at a temperature of between about 1250 and 1350 °C.

11. **(original)** The method of Claim 1 wherein the absolute pressure of the atmosphere is greater than about 2.026×10^2 kPa.

12. **(original)** The method of Claim 1 wherein the absolute pressure of the atmosphere is between about 4.052×10^2 and 16.32×10^2 kPa.

13. **(original)** The method of Claim 1 including exposing the soot preform to the atmosphere for a period of at least 60 minutes.

14. **(original)** The method of Claim 1 including exposing the soot preform to the atmosphere for a period of between about 60 and 180 minutes.

15. **(currently amended)** The method of Claim 1 wherein the soot preform includes silica and an element material selected from the group consisting of germanium, fluorine, boron, phosphorous, erbium, antimony, aluminum, and titanium.

16. **(currently amended)** The method of Claim 1 including forming the optical waveguide preform such that the optical waveguide preform includes an inner layer formed from the chlorine doped soot preform and an outer layer surrounding the inner layer, wherein:
the ~~soot preform~~ inner layer and the outer layer are formed of materials having different viscosities at drawing temperatures in the range of between about 1600 and 2150 °C; and

the chlorine doping of the soot preform improves mismatching of the viscosities of the inner layer and the outer layer at said drawing temperatures as compared to a like perform with a non-chlorine doped inner layer.

17. **(currently amended)** The method of Claim 16 wherein the inner layer includes silica and an element material selected from the group consisting of germanium, fluorine, boron, phosphorous, erbium, antimony, aluminum and titanium.

18. **(currently amended)** The method of Claim 17 wherein the outer layer includes silica and an element ~~material~~ selected from the group consisting of boron, phosphorous and fluorine.

19. **(currently amended)** A method of manufacturing an optical waveguide preform, said method comprising:

exposing a soot preform to an atmosphere including a chlorine-containing gas ~~compound~~ for a period of at least 60 minutes and thereby doping the soot preform with chlorine, wherein:

the absolute pressure of the atmosphere is substantially greater than ~~about~~ 1.013×10^2 kPa;

the mole percentage of chlorine present in the atmosphere is greater than about 20%;

the weight percentage of chlorine present in the soot preform is greater than about 1%;

the chlorine-containing gas ~~compound~~ is selected from the group consisting of GeCl_4 , SiCl_4 , Cl_2 , CCl_4 , SOCl_2 , POCl_3 and combinations thereof; and

the atmosphere is at a temperature of at least about 1000 °C.

20. **(original)** The method of Claim 19 including, prior to said step of exposing the soot preform, inserting the soot preform into a consolidation furnace.

21. **(original)** The method of Claim 19 including:

drying the soot preform prior to said step of exposing the soot preform; and
sintering the soot preform following said step of exposing the soot preform.

22. **(original)** The method of Claim 19 wherein the mole percentage of chlorine present in the atmosphere is between about 20% and 40%.

23. **(original)** The method of Claim 19 wherein the weight percentage of chlorine present in the soot preform is between about 1.0% and 1.5 %.

24. **(original)** The method of Claim 19 wherein the atmosphere is at a temperature of between about 1250°C and 1350 °C.

25. **(original)** The method of Claim 19 wherein the absolute pressure of the atmosphere is greater than about 2.6×10^2 kPa.

26. **(original)** The method of Claim 19 wherein the absolute pressure of the atmosphere is between about 4.052×10^2 and 16.32×10^2 kPa.

27. **(original)** The method of Claim 19 including exposing the soot preform to the atmosphere for a period of between about 60 and 180 minutes.

28. **(currently amended)** The method of Claim 19 wherein the soot preform includes silica and an element material selected from the group consisting of germanium, fluorine, boron, phosphorous, erbium, antimony, aluminum, and titanium.

29. **(currently amended)** The method of Claim 19 including forming the optical waveguide preform such that the optical waveguide preform includes an inner layer formed from the chlorine doped soot preform and an outer layer surrounding the inner layer, wherein: the inner layer soot preform and the outer layer are formed of materials having different viscosities at drawing temperatures in the range of between about 1600 and 2150 °C; and

the chlorine doping of the soot preform improves mismatching of the viscosities of the inner layer and the outer layer at said drawing temperatures as compared to a like perform with a non-chlorine doped inner layer.

30. **(currently amended)** The method of Claim 29 wherein the inner layer includes silica and a material selected from the group consisting of germanium, fluorine, boron, phosphorous, erbium, antimony, aluminum, and titanium.

31. **(currently amended)** The method of Claim 30 wherein the outer layer includes silica and an element material selected from the group consisting of boron, phosphorous and fluorine.

32. **(currently amended)** An apparatus for manufacturing an optical waveguide preform using a soot preform, said apparatus comprising:

a) a furnace defining a pressure chamber adapted to contain the soot preform and including a heating device operable to heat said chamber, the pressure chamber capable of attaining an absolute pressure substantially greater than 1.013×10^2 kPa; and

b) a fluid control system operable to provide an atmosphere including a chlorine-containing ~~compound~~ gas in said chamber at an absolute pressure of substantially greater than ~~about~~ 1.013×10^2 kPa.

33. **(original)** The apparatus of Claim 32 wherein said fluid control system includes:

a flow control device selectively operable to prevent and allow flow of said atmosphere into and out of said chamber;

a pressurizing device operable to pressurize said atmosphere in said chamber to a selected pressure; and

a controller operative to control said flow control device and said pressurizing device.

34. **(original)** The apparatus of Claim 33 wherein said flow control device includes at least one valve.

35. **(original)** The apparatus of Claim 33 wherein said pressurizing device includes a compressor.

Remarks

In view of the above amendments and the following remarks, favorable reconsideration of the outstanding office action is respectfully requested.

Claims 1-35 remain in this application. Claims 1, 8, 15-19, and 28-32 have been amended herein.

1. Drawings

3 Rsw 10/9/03

Formal drawings (3 sheets) are included with the Letter to the Draftsperson submitted herewith. Examiner is respectfully requested to indicate the acceptability of the drawings in the next action.

2. Un-initialed PTO-1449 Form

A PTO-1449 form was included with the application when filed on 10/26/01. Examiner has neglected to send a copy of the initialed PTO-1449 form with this action. It is respectfully requested that Examiner provide an initialed PTO-1449 form with the next office communication. A copy of the formerly submitted PTO-1449 forms is included herewith.

3. 112, 2nd Para. Rejections

The Examiner has rejected claims 1-35 for failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention. In particular, Examiner states it is unclear what is meant by the term "compound," as Cl₂ is not a compound. Examiner is correct, Cl₂ is not by its ordinary definition a compound. Accordingly, claims 1, 8, 19 and 32 are amended to read "the chlorine-containing gas..."

Additionally, Examiner rejects the use of aluminum and fluorine in claim 15. Regarding the use of aluminum, alumina oxide (Al₂O₃) is quite often included in soot preforms for active fibers, as is known to a person of ordinary skill in the art. Respectfully also, material, in Webster's New World Dictionary -Third College Edition, is defined as: of matter; of substance; or relating to or consisting of what occupies space. Clearly, a "gas" is a material according to this definition. In an effort to further clarify the claims, it is proposed claim 8 be amended such that the term "element" is used to replace the term "material" such that the phrase now reads: "silica and an element ~~material~~ selected from the group consisting of germanium..." Claims 15, 17, 18, 28, 30 and 31 have been similarly amended.

Regarding claim 16, the Examiner has rejected the claim as being unclear. However, applicant's attorney finds Examiner's explanation of the point equally unclear. As such, claim 16 has been amended in an attempt to clarify its scope to make it clear that the chlorine doping reduces viscosity mismatch between the inner and outer layer when compared to a otherwise like-doped perform without the chlorine-doped inner layer. Claim 29 is similarly amended. Accordingly, it is now believed that the 112, 2nd para. rejections should be withdrawn. Should the proposed language, for any reason, be deemed unacceptable to Examiner, it is requested that Examiner suggest appropriate alternate language that would be acceptable.

4. § 102 Rejections

The Examiner has rejected claims 1-2, 4-9, and 15-18 under 35 U.S.C. 102(b) as anticipated by U.S. Patent No. 6,116,055 to Ishikawa. (Ishikawa '055).

The Examiner asserts that Ishikawa teaches 99 kPa absolute pressure atmosphere and then indicates that 99 kPa is about 101.3kPa.

As amended, the rejection is overcome. Ishikawa does not teach chlorine doping at a pressure substantially above atmospheric pressure, as claimed. Accordingly, 102(b) rejection is inappropriate.

Ishikawa '055 teach that the partial pressure of SiCl₂ is preferably greater than 0.03 atm and less than 1 atm (*emphasis added*). (See Col. 1, lines The reference, as a whole, teaches the undesirability of doping at pressures above 1 atm. Accordingly, the reference "*teaches away*" from the claimed invention, as nowhere in the '055 reference does it teach or suggest that the soot preform should be exposed to a chlorine-containing atmosphere having an absolute pressure of substantially greater than 1.013×10^2 kPa. Further, in no way does Ishikawa indicate that it is desirable to chlorine dope at high pressure such that enhanced levels of chlorine doping may be achieved. Likewise, there is no means shown for doping at high pressure. Thus, the reference is completely non-enabling as to how one might dope with chlorine at high pressure. Further, to reduce the issue of whether 99 kPa is about 101.3 kPa, the term "about" has been removed from claims 1, 19 and 32. Accordingly, the rejection of claim 1 is overcome and should be withdrawn. Claims 2, 4-9 and 15-18 are allowable as Ishikawa likewise does not teach or suggest any of the conditions under which high pressure doping should preferably occur.

Claims 32-35 are rejected under 35 USC 102(b) as being clearly anticipated by Kyoto 5,145,507. The Examiner's view is that the method is use limitations do not impart any structural limitations.

Kyoto does not teach a high pressure doping furnace as contemplated by the claim. As amended, the furnace requires a pressure chamber capable of attaining an absolute pressure substantially greater than 1.013×10^2 kPa; and a fluid control system operable to provide an atmosphere including a chlorine-containing gas in said chamber at an absolute pressure of substantially greater than 1.013×10^2 kPa. Appropriately, the claim does include sufficient structure that is neither taught or suggested in Kyoto. Accordingly, the 102(b) rejection should be withdrawn.

5. § 103 Rejections

The Examiner has rejected claims 3, 10-14, and 19-31 under 35 U.S.C. 103(a) as unpatentable over Ishikawa 6,116,055.

The 103(a) rejection of claims 3, 10-14 and 19-31 is inappropriate given the '155 disclosure, as a whole, *teaches away* from the claimed invention (as explained above) as the Ishikawa reference lacks any suggestion or motivation to do what Applicants' have done, but, in fact, teaches that chlorine doping should be accomplished at pressures between 0.03 and 1 atm. Accordingly, the 103(a) rejection is flawed and should be withdrawn.

6. Conclusion

Based upon the above amendments, remarks, and papers of record, Applicant believes the pending claims of the above-captioned application are in allowable form and patentable over the prior art of record. Applicant respectfully requests reconsideration of the pending claims 1-35 and a prompt Notice of Allowance thereon.

Applicant believes that no extension of time is necessary to make this Response timely. Should Applicant be in error, Applicant respectfully requests that the Office grant such time extension pursuant to 37 C.F.R. § 1.136(a) as necessary to make this Reply timely, and hereby authorizes the Office to charge any necessary fee or surcharge with respect to said time extension to the deposit account of the undersigned firm of attorneys, Deposit Account 03-3325.

Please direct any questions or comments to Randall S. Wayland at 607-974-0463.

Respectfully submitted,

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Date: 10/9/03



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